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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/854,206	05/11/2001	David S. Pecora	00-0737.00/US	7849

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EXAMINER
TRAN, BINH X

ART UNIT	PAPER NUMBER
1765	9

DATE MAILED: 02/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/854,206	PECORA, DAVID S.	
	Examiner	Art Unit	
	Binh X Tran	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1-27-2003 has been entered.

Specification

2. The amendment filed 1-27-2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: The examiner cannot find the support for the phrase "in the absence of a photoresist layer" in the original disclosure.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 8-9 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claims 1, 8-9, the examiner cannot find support in the original specification for the negative limitation "in the absence of a photoresist layer". Any negative limitation or exclusionary proviso must have basis in the original disclosure. The mere absence of a positive recitation is not basis for an exclusion. Any claim containing a negative limitation which does not have basis in the original disclosure should be rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement (MPEP 2173.05(i)).

In claims 1, 8-9, the examiner cannot find the support in the original specification for the limitation "said etchant comprises at least about 75% of said oxygen and less than about 25% of said one of CHF_3 and CH_2F_2". The examiner recognizes that the applicants discloses the flow rate ratio of O_2:CHF_3 or O_2:CH_2F_2 of greater than 3:1. However this flow rate ratio of greater than 3:1 is not exactly identical with the limitation of about 75% oxygen and less than about 25% of one of CHF_3 and CH_2F_2. One skill in the art still can choose for example of at least 69% oxygen and less than 23% of one of CHF_3 and CH_2F_2 to satisfy a condition of a flow rate ratio greater than 3:1.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-2, 8-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 8, 9 "with an etchant consisting essentially ...wherein said etchant comprises" is vague and indefinite. The term "consisting essentially of" is narrower than the term "comprise" according to the MPEP. The applicants wish to narrow the etchant composition in the beginning of the claim by using the term "consisting essentially of". Therefore applicants cannot broaden the etchant composition by using the term "comprise" later in the claim.

In claims 2, 10, the limitation "said oxygen and said one of CHF_3 and CH_2F_2 into an etch chamber at a ratio of about 3:1 during said etching" is contradict with the previous claims 1 or claim 9. In claims 1 and 9, the applicants already claim that limitation "said etchant comprises at least about 75% of said oxygen and less than about 25% of said one of CHF_3 and CH_2F_2". The examiner interpret that the percentage of oxygen must be equal or greater than about 75% and the percentage one of CHF_3 and CH_2F_2 must be less than 25%. Base on this number, any one skill in the art would be able to calculate that the ratio of oxygen and said one of CHF_3 and CH_2F_2 must be greater than 3:1. This ratio cannot be about 3:1.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-6, 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuo et al. (US 5,994,227) in view of Yatsuda et al. (EP 0945896 A1).

Matsuo discloses a method for etching a silicon nitride layer comprising:

etching the silicon nitride layer after the resist mask is removed in previous step (read on "in the absence of a photoresist layer) with an etching consisting essentially of oxygen and CH_2F_2 (See Fig 3-5, col. 3 lines 5-8, col. 3 lines 25-50).

Claim 1 differs from Matsuo by the specific flow rate, pressure and the specific percentage of oxygen and at least one of CHF_3 and CH_2F_2. However, Matsuo discloses that the mixture ratio of oxygen and CH_2F_2 is a result effective variable (Fig 6). Since mixture ratio is the result effective variable, the flow rate of individual oxygen and CH_2F_2 must be a result effective variable because the mixture ratio depends on flow rate of oxygen divided and the flow rate of CH_2F_2.

In a silicon nitride etching process, Yatsuda discloses that pressure and flow rate is the result effective variable. Yatsuda discloses that the pressure is about 50-100 mtorr (within applicant's range of 10-60 mtorr). Yatsuda also discloses the flow rate of CH_2F_2 is about 20-60 sccm (within applicant's range of 5-25 sccm) and the flow rate of oxygen is about 20-100 sccm (page 5, within applicant's range of 20-80 sccm). The result effective variables are commonly determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one

having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal value as an expected result.

Yatsuda discloses the silicon nitride was etched using CH_2F_2/O_2. Yatsuda further discloses the ratio of CH_2F_2/O_2 ranges from 0.2 to 0.6 (Fig 5). Since Yatsuda clearly discloses the specific ratio range of CH_2F_2/O_2. Any person having ordinary skill in the art, would be able to choose any ratio within the suggested range of Yatsuda. For example, if one chooses the ratio of CH_2F_2/O_2 is less than 1/3 (less than 0.3333), one skill in the art can convert it into less than 25% oxygen and greater than 75% of CH_2F_2.

Respect to claim 2, Matsuo does not explicitly disclose the ratio of oxygen to CH_2F_2 is about 3:1. Yatsuda discloses the silicon nitride was etched using CH_2H_2/O_2. Yatsuda further discloses the ratio of CH_2F_2/O_2 is range from 0.2 to 0.6 (Fig 5). Since Yatsuda clearly disclose the specific ratio range of CH_2F_2/O_2. Any person ordinary skill in the art, would be able to choose any ratio within the suggested range of Yatsuda. For example, if one chooses the ratio of CH_2F_2/O_2 is less or equal than 1/3, one skill in the art would be able to calculate the ratio of O_2 to CH_2F_2 is greater or equal to about 3:1

Claims 3-6 differ from the cited prior art by the specific value of power, flow rate of CH_2F_2 and oxygen. Yatsuda discloses that power is set to about 500 watts (page 6 line 6, read on applicant's range of 300-600 Watts). The flow rate and pressure are result effective variable. The result effective variables are commonly determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it

would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal value as an expected result.

Respect to claim 8-9 Matsuo discloses:

providing a semiconductor wafer assembly comprising a semiconductor substrate (30) and a layer a silicon dioxide overlying the wafer (Fig 1, col. 2 lines 57-67);

forming a silicon nitride (5) over the semiconductor substrate (30) and the silicon dioxide layer;

placing the semiconductor wafer assembly into an etch chamber;

etching the silicon nitride layer after the resist mask is removed in previous step (read on "in the absence of a photoresist layer) with an etching consisting essentially of oxygen and CH_2F_2 (See Fig 3-5, col. 3 lines 5-8, col. 3 lines 25-50) to expose the semiconductor substrate and the silicon dioxide layer (aka silicon oxide layer, See Fig 4 and/or Fig 9) .

The limitation regarding the specific percentage of oxygen and CH_2F_2 has been discussed in previous paragraphs. Matsuo does not disclose the semiconductor substrate is silicon. Yatsuda disclose that the semiconductor substrate is silicon (2).

Claims 8-9 differ from the cited prior by the specific value of pressure. This limitation has been discussed in previous paragraph. The limitation of dependent claims 10-15 is identical with the limitation of dependent claims 2-6 which already discussed in previous paragraph.

9. Claims 7, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuo and Yatsuda in view of Campell.

Claims 7 and 16 differ from the cited prior art by the specific value of power, and pressure. The limitation regarding the specific pressure as a result effective variable has been discussed in previous paragraphs. Campbell discloses that power is the result effective variable during the etching process by varying the power from 0 Watt to 3 KW (Fig 11, 300-400 Watts). The result effective variables are commonly determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal value as an expected result.

Response to Arguments

10. Applicant's arguments with respect to claims 1-16 about the 102 and/or 103 rejection have been considered but are moot in view of the new ground(s) of rejection.

11. The argument with respects to the negative limitation is not persuasive. The applicants argue that neither Fig 1 or 2 depict the photoresist layer would provide literal support for the negative limitation. The examiner strongly disagrees. The examiner recognizes that the applicants never disclose about the photoresist layer in the original disclosure. However, a negative limitation must be positively support by the original disclosure. According to the MPEP, any negative limitation or exclusionary proviso must have basis in the original disclosure. The mere absence of a positive recitation is not basis for an exclusion.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran
February 4, 2003

BENJAMIN L. UTECH
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